NOTES ON THE DEVIL *(SARCOPHILUS HARRISI)* AND THE QUOLL *(DASYURUS VIVERRINUS)* IN NORTH-EASTERN TASMANIA

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SUMMARY

A series of 33 Devils (*Sarcophilus harrisi*) and 49 Quolls (*Dasyurus viverrinus*), were collected in north-eastern Tasmania in July, 1964. The topography, vegetation and associated fauna of the area from which they were taken are discussed.

Brief descriptions of the Devil and Quoll are given including notes on pelage. Weights and measurement of carcases and a series of skull measurements are tabulated and show that in both species males generally exceed the females in all proportions. A significant imbalance in favour of males occurred in the adult Quolls.

Data are given on breeding, pouch condition and development of the pouched young. Sixteen sets of pouched young Quolls are tabulated to show sex and colour phase proportions. The colour phase of Quolls is determinable from a crown-rump length of 10 mm.

Contents of the stomachs are tabulated and discussed and some effects of fighting and accidental snaring are noted.

A list of ectoparasites recorded from both species in Tasmania is given.

General comments are given on the probable effect of land development, the predatory habits of the species, and the implications that these factors may have on their future population.

I. INTRODUCTION

The Devil (*Sarcophilus harrisi*) and Quoll (*Dasyurus viverrinus*) are again becoming plentiful in Tasmania and are now being found in areas where they have not been recorded for many years.

Since the advent of white man to Tasmania both species have been drastically reduced in numbers and range. Shrinkage of range inevitably followed the spread of settlement, because of destruction of forest habitat and even the animals themselves by settlers when they preyed on domestic poultry and stock. In addition, a disease affecting the larger dasyurids is believed to have caused a sudden decline in the early part of this century (Guiler 1964) and apparently extended to areas not affected by the human population.

The numerical fluctuations of both species during the nineteenth century are difficult to trace and the few published accounts are little more than impressions. Referring to the Devil, Waterhouse (1846) quoting a Mr. Harris states, "these animals were very common on our first settling at Hobart Town and were particularly destructive to poultry etc. They, however, furnished the convicts with a fresh meal and the taste was said to be not unlike veal".

Gould (1863) states, "It has now become so scarce in all the cultivated districts, that it is rarely, if ever, seen there in a state of nature".

Smith (1909) states that the Devil was still widespread as late as 1909 but by 1918 Lord (1918) states "It is now only met with in the rugged unsettled areas". In the next few years, because of the rarity of sightings, fear was often expressed that the Devil along with the Tasmanian Tiger (*Thylacinus cynocephalus*) was facing imminent extinction but in recent years the Devil has undergone a spectacular population recovery and is today abundant over large areas of the State.

There is little published information available on the past status of the Quoll in Tasmania but from inquiries and personal knowledge it seems that its population fluctuation followed a similar pattern to that of the Devil. In most of the midlands it is still a rare animal but in the days of early settlement must have been very plentiful in this area. Backhouse (1843) having visited the property of Mr. John Bisdee in the southern midlands in February, 1834 stated: "The Common Pheasant has been introduced upon this estate, and in order to preserve it, his men have been encouraged to destroy the Native Cats, by receiving eight-pence for each of their skins. These animals are so numerous, that at one time the people brought in six hundred skins". Despite these efforts the Pheasants did not become established.

Referring to the Middlesex Plains and Cradle Mountain areas in the rugged north-western highlands, Weindorfer and Francis (1920) stated: "The light brown, white-spotted variety is fairly plentiful in the district; the black and white extremely rare."

Both the Devil and Quoll have now reached virtual pest proportions in some pastoral areas, particularly in the north-west and north-east of the island. Because of its larger size and voracious appetite the Devil is considered a greater pest in the rural areas than the Quoll although the latter may in fact be even more prevalent.

A general account of the Devil is given by Guiler (1964) and Sharland (1962) discusses both the Devil and the Quoll.

In 1964 the opportunity was taken to collect a series of specimens from a pastoral property near Gladstone in north-eastern Tasmania. A limited permit had been issued to the owners to destroy marauding Devils which were in such numbers that they were believed to be preying on young lambs. Consequently with the co-operation of the stock manager, a quantity of the material was salvaged from the animals destroyed under his permit.

A preliminary note based on this material is given here and except where otherwise stated, is confined to this sample. An investigation of wider scope is envisaged in the future.,

II. HABITAT AND ASSOCIATED FAUNA

The sample was collected on Icena Estate, about eight miles north-east of Gladstone in the far north-east of Tasmania. (See map, fig. 1). Collecting was confined to an area of homestead paddocks totalling about a thousand acres and along two roads for a distance of about five miles from the homestead.

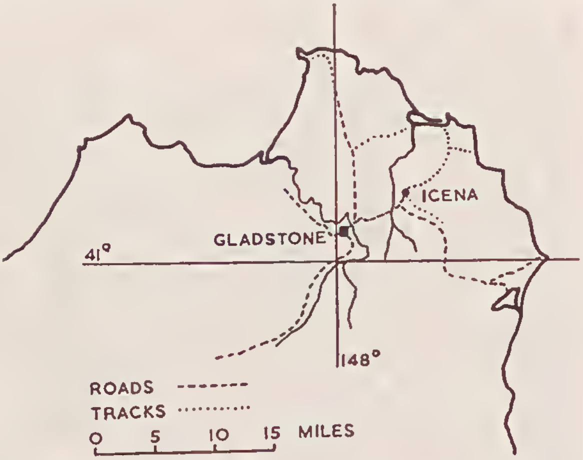

Figure 1. Sketch map of the Gladstone district in north-eastern Tasmania, showing the location of the area from which the animals were collected.

This area lies within the coastal plain but some miles further inland the topography becomes hilly rising in places to over a thousand feet. Soils are mostly yellow podzols supporting dry sclerophyll forest but the northern coastal strip supports mainly coastal heath.

The forest consists mostly of eucalypts including *Eucalyptus obliqua, E. viminalis, E. amygdalina* and *E. ovata,* with a scattering of *Casuarina quadrivalvis* (She Oak) occurring in dense clumps on banks. *Banksia marginata* (Honeysuckle) is also quite common. An under storey of *Melaleuca ericifolia* (Swamp Tea-tree) and *M. squarrosa* (Bottle Brush), occurs in thick clumps throughout the forest areas; while along the water courses *Leptospermum lanigerum* (Woolly Tea-tree) and *Hakea nodosa* (Nut Bush) grow densely. The ground cover includes *Pteridium esculentum* (Bracken Fern), *Diplarrhena moraea* (Sagg), *Xerotes longifolia* (Sagg), *Epacridaceae* spp. (Heaths), *Ricinocarpus pinifolious* (Wedding Bush), *Hibbertia procumbens* (Guinea Flower) and *Baeckea ramosissima.*

In open areas *Casuarina distyla* (Ground Oak), *Melaleuca gibbosa* (Tea-tree) and *Leptospermum scoparium* (Tea-tree) often form a dense ground cover growing to about two feet.

Gymnoschoenus sphaerocephalus (Button Grass) also occurs in fairly extensive belts as openings in the forest.

The principal coastal vegetation includes *Eucalyptus* spp., *Acacia sophorae* (Boobyalla), *Bursaria spinosa* (Prickly Box) and *Leucopogon virgatus* (White Currant) with a ground cover of *Epacridaceae* spp. (Heaths), *Ricinocarpus pinifolious* (Wedding Bush) and *Xerotes longifolia* (Sagg).

Sheep and cattle are grazed throughout the whole area and much of the suitable land is now being cleared, ploughed and developed into improved grasslands.

Annual rainfall averages about 30 inches, being slightly less on the coast and slightly more on the higher inland areas.

Mean summer temperature (January) is about 62°F. and mean winter temperature (July) about 48°F., with extremes from 95°F. to 25°F.

The area in its natural form provided a favourable environment for most of the mammal and bird species recorded from Tasmania (see tables 1 and 2) and although land development is removing natural habitat, it is providing an enhanced food supply for some species. However, when predation by native animals becomes excessive, population control becomes a necessary part of good pasture and stock management.

Three large macropods (see table 1) occur in sufficient numbers to cause significant pasture damage by grazing on areas where pasture improvement is taking place and both snaring and shooting are continuously employed to keep both wallaby species in check. The Forester Kangaroo is afforded total protection because of its limited distribution.

Examination of stomach contents of Devils and Quolls suggests that their status may well be influenced by the present macropod population. However, the partly insectivorous diet and partly arboreal habits of the Quoll make this animal a more generalised feeder and probably less dependent on scavenged foods so efficiently used by the Devil.

Both species co-exist in similar habitat and may be trapped side by side. However, the Devil is cannibalistic and will readily eat the dead of its own kind. Batey (1907) refers to cannibalism in the Quoll.

They appear to have few natural enemies but station dogs left unchained at night take a toll of Devils and Quolls which venture too close to homesteads.

III. METHODS AND MATERIALS

(i) Collecting

Most of the animals were taken in steel rabbit traps set on the ground and tied to a fence or tree. A meat bait (Wallaby, Devil or Quoll) was suspended about three feet above the open trap and the animals became caught by the feet in their efforts to secure the bait. Devils were killed by shooting through the heart with a .22 rifle and Quolls were killed by breaking the neck in the same manner as killing a rabbit. Traps were cleared at first light each morning and the catch transported back to the base camp for processing.

A few poison bait stations were used by applying strychnine to a Wallaby carcase. Though Devils took the bait well, none were salvaged as they apparently travelled some distance before dying. One Devil head was found several hundred yards from the bait station, the rest of its carcase having apparently been eaten by its own kind. A number of Quolls were poisoned on bait stations, usually in pairs, and were found within 50 yards of the station.

Five Quolls were collected by shooting at night with the aid of a spot light.

TABLE 1. Mammal species (excluding domesticated stock) occurring in Tasmania with an indication of their numerical status on the Icena Estate.

SPECIES	NUMERICAL STATUS
Forester Kangaroo *Macropus giganteus*	Plentiful
Bennetts Wallaby *Wallabia rufogrisea*	Very plentiful
Pademelon *Thylogale billardieri*	Very plentiful
Bettong *Bettongia cuniculus*	Uncommon
Potoroo *Potorous tridactylus*	Uncommon
Brush Possum *Trichosurus vulpecula*	Very plentiful
Ringtail Possum *Pseudocheirus convolutor*	Present
Flying Possum *Petaurus breviceps*	Uncommon
Pigmy Possum *Cercartetus nanus*	Uncommon
Lesser Pigmy Possum *Eudromicea lepida*	Rarely found
Wombat *Vombatus ursinus*	Plentiful
Brown Bandicoot *Isoodon obesulus*	Uncommon
Striped Bandicoot *Perameles gunnii*	Uncommon
Tasmanian Tiger *Thylacinus cyanocephalus*	Not positively recorded for many years.
Devil *Sarcophilus harrisi*	Very plentiful
Tiger Cat *Dasyurops maculatus*	Rare
Quoll *Dasyurus viverrinus*	Very plentiful
Spiny Anteater *Tachyglossus setosus*	Plentiful
Platypus *Ornithorhynchus anatinus*	Plentiful
Water Rat *Hydromys chrysogaster*	Plentiful near the coast and rivers
Rats (Species unknown)	Present but more plentiful some years ago
European House Mouse *Mus musculus*	Plentiful at times
Rabbit *Oryctolagus cuniculus*	Present in limited numbers
Ferral Cat *Felis domesticus*	Not commonly seen

TABLE 2. Bird species (excluding domesticated stock) recorded in the Icena Estate area with an indication of their numerical status. Possible role in the ecology of the Devil and Quoll given in brackets.

SPECIES		STATUS
Little Penguin *Eudyptula minor*	(Food)	A few at times along the coast
Quail species	(Food)	Present
Bronzewing species	(Food)	Not plentiful
Lewins Water-rail *Rallus pectoralis*	(Food)	A few about the rivers
Native Hen *Tribonyx mortierii*	(Food)	Plentiful in parts
Bald Coot *Porphyrio melanotus*	(Food)	A few in parts
Coot *Fulica atra*	(Food)	Common in the sheltered bays
Pied Oystercatcher *Haematopus ostralegus*	(Food)	Common on coastal beaches
Sooty Oystercatcher *Haematopus unicolor*	(Food)	Common on the coast
Spurwing Plover *Lobibyx novae-hollandiae*	(Food)	Plentiful
Banded Plover *Zonifer tricolor*	(Food)	Rarely recorded
Hooded Dotterel *Charadrius cucullatus*	(Food)	A few on coastal beaches
Double-banded Dotterel *Charadrius bicinctus*	(Food)	Common in winter on coastal beaches
Red-Capped Dotterel *Charadrius alexandrinus*	(Food)	Common on coastal beaches
Snipe *Gallinago hardwickii*	(Food)	A few in summer
White-faced Heron *Notophoyx novae-hollandiae*	(Food)	A few present
Brown Bittern *Botaurus poiciloptilus*	(Food)	A few present
Black Swan *Cygnus atratus*	(Food)	Plentiful on coastal bays and lagoons; breeding in wet years
Duck species	(Food)	Plentiful on coastal bays and lagoons
Swamp Harrier *Circus approximans*	(Food/Predator)	Common
Wedge-tailed Eagle *Aquila audax*	(Predator)	Several pairs live and breed in the area
Sea Eagle *Haliaeetus leucogaster*	(Predator)	Several pairs breed in the coastal area
Brown Hawk *Falco berigora*	(Food)	Common
Owl Species	(Food/Predator)	A few present
Lorikeets or Parakeets	(Food)	Plentiful
Black Cockatoo *Calyptorhynchus funereus*	(Food)	A few present
Green Rosella *Platycercus caledonicus*	(Food)	Plentiful
Ground Parrot *Pezoporus wallicus*	(Food)	A few in coastal heath land
Frogmouth *Podargus strigoides*	(Food)	A few present
Kookaburra *Dacelo gigas*	(Food)	Liberated in the area about 1920, now common
Quail-thrush *Cinclosoma punctatum*	(Food)	Rare
Australian Pipit *Anthus australis*	(Food)	Common
Australian Raven *Corvus* sp.	(Food)	Plentiful
Clinking Currawong *Strepera arguta*	(Food)	Common
White-backed Magpie *Gymnorhina hypoleuca*	(Food)	A few prior to 1950 but now appears absent
Blackbird *Turdus merula*	(Food)	Common
Sparrow *Passer domesticus*	(Food)	Plentiful
Goldfinch *Carduelis carduelis*	(Food)	Common
Starling *Sturnus vulgaris*	(Food)	Plentiful

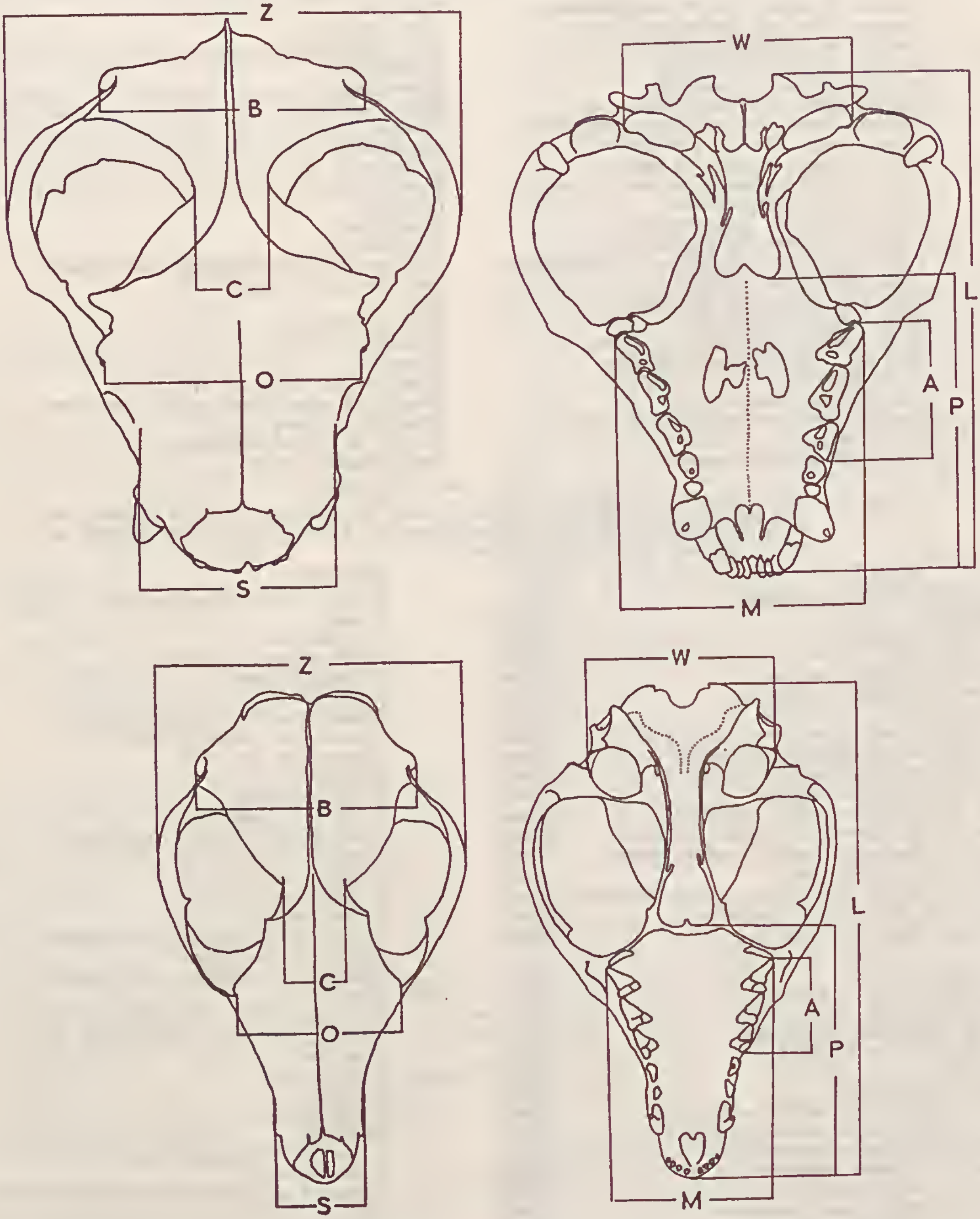

Figure 2. Points from which the skull measurements were taken. Upper, Devil; Lower, Quoll.

Ectoparasites were collected from a large sample of Devils and Quolls. The freshly collected animals were placed in large plastic bags together with a few drops of chloroform and left till the parasites had been killed. Parasites were then shaken or brushed from the fur on to a large sheet of paper and preserved in 70% alcohol. Ticks and subcutaneous flea larvae were removed with small forceps.

After skinning, the carcases were opened and visible endoparasites collected and preserved in 70% alcohol. Lungs were removed and preserved in 4% formalin. Most stomachs were examined and the contents recorded. Testes were measured, length by width. Fat condition was recorded together with any general comments.

Heads were removed, boiled and the skulls cleaned and air dried.

Over a ten day period from 20:VII:1964 to 30:VII:1964 a total of 33 Devils (19♂♂ and 14♀♀) and 49 Quolls (36♂♂ and 13♀♀) were collected and processed in this manner. The imbalance between sexes is not sufficient in the Devil to be statistically significant. That between male and female Quoll certainly is but at this stage of the investigation no explanation is offered. Two Devils and 12 Quolls were found to be carrying pouched young. In each instance, the mammary glands together with the surrounding pouch skin were removed and preserved with the pouched young in 70% alcohol.

All lung material was handed to the Mt. Pleasant Laboratories, Department of Agriculture, Launceston, for examination for the occurrence of cysts of *Emmonsia crescens*, a growth occurring in the lungs of northern hemisphere ground dwelling mammals, but not yet recorded as occurring in Australia. All results for both species were negative (Munday 1966). The brains of 3 Devils and 7 Quolls were likewise sent to the above Department for inclusion in a survey of Toxoplasmosis in native mammals. Results were again negative for both species (Munday 1966).

Parasitic material has been passed on to Mr. J. H. Calaby, Division of Wildlife Research, C.S.I.R.O., Canberra, for determination and preservation.

The skins, dried flat and unfilled, together with associated skulls and pouched young have been lodged in the collections of the Queen Victoria Museum and registered within the series 1964:1:124 to 1964:1:242.

(ii) Measurement techniques

(a) Bodies. Devils were weighed on a balance scale with a clock face graduated in pounds and ounces, and Quolls were weighed on a tray-top balance scale with metric graduations.

Both species were measured in the flesh for :

Total length : From the nose tip to the tail tip excluding terminal hair, the measurement being taken dorsally with the animal lying on its back.

Tail length : From the base of the tail to the tail tip excluding terminal hair, the measurement taken dorsally with the tail turned up at a right angle to the back.

Ear : From the outer edge of the tragoid notch to the tip of the ear, excluding the hair.

Pes : From the back of the heel to the end of the longest toe excluding the claw.

Scrotum : Measured laterally and anterior posteriorly.

(b) Skulls. The following measurements were taken as illustrated in Figure 2:

Condylo-basal length (L)
Zygomatic width (Z)
Post orbital constriction (C)
Cranium width (B)
Pre optical width (O)
Snout width (S)
Palatal Length (P)
Mastoidal width (W)
Alveola length (A)
Width at M^3 (M)

Measurements recorded by the use of callipers were made to the nearest millimeter on the Devil skulls and to the nearest tenth of a millimetre on the Quoll skulls.

IV. SARCOPHILUS HARRISI

(i) General Description

The Tasmanian Devil (Plates 1, 2) is a stout thickset animal. A full-grown male may stand to about twelve inches at the shoulders and have a head and body length of two feet with a tail a foot long. It may attain a body weight of up to 26 pounds. The head and neck are broad and powerfully built and the jaws are very strong. It is rather slow and clumsy in its movements and appears to possess a powerful sense of smell, as it noses the ground almost continuously in its slow meandering gait. Its general disposition appears savage and disagreeable and it will readily growl and show its powerful teeth when disturbed. Though its bite is capable of inflicting a severe wound, its lack of swift aggressive movements renders it less dangerous than its appearance suggests. Captive animals under the care of a good keeper have been known to become quite docile and easily handled.

(ii) Body Weight and Size

In average weight and size males exceeded females by a significant margin, and were generally of a more robust appearance (see table 3).

The tail, ear and pes length, expressed as a percentage of the total length (see table 4), gives some idea of the body proportions of the sex groups but shows very little sexual dimorphism.

(iii) Skull

The skull measurements shown in table 5 also indicate the greater mean size of males. When the mean values are expressed as a percentage of the condylo-basal length (see table 6) they show the skulls of males to be relatively broader than those of females and with a significantly narrower post orbital constriction. This was also found to be the case in the Quolls.

The sagital crest is noticeably higher in the larger and apparently older animals.

Tooth wear is present on all teeth and in some instances the molar cusps have been worn down to the body of the tooth. The tips of incisors, canines and premolars exhibit wear to a similar degree.

Tooth fracturing is common and in older animals may be extensive with any teeth being affected. Some molars were found broken off at gum level and others split with the two halves remaining in place. Several canines were found to have broken tips and the closely set incisors were badly fractured in a number of instances.

The only deviation from the normal dental complement of I. 4/4, C. 1/1, P.M. 2/2, M. 4/4 was the occurrence in four skulls (Reg. No. 1964:1:124♂; 134♀; 186♂; 201♂) of a fifth upper right molar. (See plate 3). In each instance these were found internally adjacent to and about half the size of M^4. They all exhibited wear to a degree similar to the associated teeth and the crown level was lower than that of M^4.

There was no indication of decay in the teeth of any Devils.

TABLE 3. Comparative body measurements of males and females of the Devils, showing the range, mean in brackets and standard deviation respectively. Weight in pounds, lengths in millimetres.

	Males (19)			Females (14)		
Weight	12 - 26	(18.2)	4.38	9 - 18	(12.2)	2.42
Total length	740 - 910	(844.6)	49.22	750 - 840	(776.7)	28.91
Tail length	235 - 285	(258.9)	14.68	215 - 270	(244.6)	15.87
Ear length	63 - 80	(70.2)	5.92	58 - 73	(63.3)	4.88
Pes length	85 - 96	(91.0)	3.12	77 - 85	(83.7)	2.74

TABLE 4. Showing length of tail, ear and pes expressed as a percentage of the total length of males and females of the Devils.

	Males	Females
Tail length	30.6	31.5
Ear length	8.3	8.1
Pes length	10.8	10.8

TABLE 5. Comparative skull measurements of males and females of the Devils. The mean is shown in brackets.

	Males		Females	
Condylo-basal length	117 - 140	(131.6)	116 - 132	(122.3)
Zygomatic width	97 - 126	(112.2)	95 - 111	(100.7)
Post orbital constriction	18.5 - 20.5	(19.5)	19 - 21	(20.4)
Cranium width	62 - 77	(70.8)	59 - 67	(63.5)
Pre optical width	50 - 60	(55.4)	49 - 54	(51.2)
Snout width	35 - 43	(39.0)	33 - 39	(35.7)
Palatal length	71 - 81	(76.3)	69 - 78	(72.0)
Mastoidal width	57 - 68	(63.2)	56 - 60	(58.7)
Alveola length	34 - 36	(35.0)	33 - 36	(34.5)
Width at M^3	62 - 67	(63.8)	57 - 63	(61.0)

TABLE 6. Showing the Devil skull measurements expressed as a percentage of the condylo-basal length.

	Males	Females
Zygomatic width	85.3	82.3
Post orbital constriction	14.8	16.7
Cranium width	53.8	51.9
Pre optical width	42.1	41.9
Snout width	29.6	29.2
Palatal length	58.0	58.9
Mastoidal width	48.0	48.0
Alveola length	28.1	28.2
Width at M^3	48.5	49.8

(iv) Pelage

An examination of the Icena series reveals the under fur to be dark brown, being darkest on the shoulders and mid dorsal region. The outer fur is a uniform black. This produces a superficially black appearance but in the older specimens with less dense fur a brownish shade becomes noticable. The body fur reaches to 20 mm. and the guard hairs to 35 mm. In most Devils the fur appears densest on the hind quarters, but in the case of several aged individuals the densest region is on the shoulders.

Hair on the toes of the front feet is short and does not cover the claws. On the toes of the hind feet it extends beyond the claws, in most instances completely covering them. The claws of the front feet exhibit more wear than do those of the hind feet, reflecting greater use.

Hair on the distal half of the tail is long and in extreme examples reaches to 80 mm. In most animals this hair and that in the region of the pouch or scrotum shows a reddish-brown shading.

The vibrissae are black and vary considerably in length and thickness. The mystacial reach to 140 mm. with up to 34 in each set, genal to 130 mm. with up to 15 a set, supraorbital to 78 mm. with up to 7 a set and interramal to 60 mm. with up to 7 a set.

Most Devils possess minor white markings and though this varies in extent between individuals the positioning is constant. These white markings occur in two regions only.

(1) As a rump spot situated just forward of the base of the tail.

(2) As a neck and shoulder blaze extending in a crescent from beneath the base of the neck onto the anterior scapular region.

The rump spot may be up to 40 mm. across. The neck-shoulder blaze may be continuous, broken or merely occur as an odd isolated marking on the neck or shoulders.

Of the 33 Devils examined, 19 possessed both markings in varying extent, 7 possessed only the neck-shoulder blaze or part thereof, 2 possessed only the rump spot, in both instances very small, and 5 had no markings.

(v) Breeding

Of the 14 females collected, 12 had empty pouches with no obvious signs of lactation.

In the non-lactating females the pouch opening of dead animals, measured when in its normal relaxed state, ranged from 30 mm. to 45 mm. across. In depth, forward of the anterior edge of the pouch opening, it ranged from 10 mm. to 50 mm.

The normal nipple complement was 4 with little difference in the size range, the length being about 4 mm. There was no indication that suckling continues once the young become independent of the pouch. One female, (Reg. No. 1964:1:178) possessed a fifth nipple on the right side and posterior to the four normally positioned nipples. It was much smaller than the others and was probably non-functional. Coarse reddish-brown hair was growing from the inside edge of the pouches. It varied in density and length between individuals but in some cases was quite prominent and reached a length of 100 mm.

Reg. No. 1964:1:151, a female trapped on 24:VII:1964 and of 13.5 lbs. body weight, carried 3 pouched young (2♀♀ and 1♂) of an approximate total length of 160 mm. (see plate 4). The anterior right nipple was vacant, partly inverted and reaching to 7 mm. in a normal retracted position. The remaining 3 occupied nipples ranged from 25 mm. to 30 mm. in length and were partly flattened to 7 mm. presumably by the sucking action of the young. The terminal two thirds of the occupied nipples were held within the mouth of the young. Little effort was required to remove them. The normal pouch opening was 70 mm. and the depth was 80 mm. Reddish-brown hairs growing from the inner edge of the pouch reached to 80 mm.

The mouths of the young were not open more than necessary to accommodate the nipple and none of the teeth had erupted. Body fur was sparse and reached to 2 mm. but was more prominent on the head and dorsal thoracic region. Vibrissae were black with the mystacial reaching to 22 mm., genal to 22 mm., suproarbital to 18 mm., and interramal to 16 mm.

The eyes and ears appeared to have recently opened. The claws on the front and hind feet were stout, reaching to 3 mm. in length. The head was proportionally large and about 70% of the body length. One female was slightly less developed than her two pouch mates.

Reg. No. 1964:1:203, a female trapped on 29:VII:1964 and body weight of 12 lbs., carried one pouched young attached to the posterior right nipple. The 3 unoccupied nipples were 3 mm. long and their associated milk glands showed no signs of lactation. The occupied nipple and young were, for all practical purposes, similar to those of 1964:1:151. The pouch opening was 50 mm. and depth 60 mm. with pouch hair to 80 mm.

Reg. No. 1964:1:158, a single female pouched young, was found on 24:VII:1964 when it had apparently been cast from its mother's pouch when she became caught in a necker snare set for wallabies. The mother had subsequently escaped by chewing through the wire snare and had abandoned the young. It was alive when found and had a body weight of 190 gm. and a total length of 230 mm.

The fur was longest on the head and neck where it reached to 10 mm. The vibrissae were black with the mystacial reaching to 31 mm., the genal to 33 mm., supraorbital to 25 mm., and interramal to 18 mm. The head was proportionally large being about 70% of the body length. Eyes, ears and mouth were fully open. One pair of incisor teeth in the upper jaw and one pair of incisors in the lower jaw were just starting to erupt.

Guiler (1964) states that Devils breed in March and that the young have presumably all left their mother's pouch by late October. Though the material in the present series supports this conclusion, the Queen Victoria Museum collection contains 2 sets of pouched young collected from the Icena area in 1963 which probably would not have become independent until November. 1963:1:268 collected during September includes 4 pouched young in which the fur had only just begun to erupt on the head and neck. 1963:1:269 collected during October includes 2 pouched young firmly attached to the nipples and only slightly more advanced than those described under Reg. No. 1964:1:151.

The testes of the males collected in the present Icena series ranged from 15 x 11 mm. to 20 x 17 mm., the heavier animals usually having the larger testes.

(vi) Stomach Contents

Most of the stomachs were opened immediately after skinning and the contents found to be poorly masticated. In many instances the Devils were found to have been feeding on Wallabies (*Wallibia rufogrisea*) as the fur of this animal was identifiable in nine stomachs (see table 7). Wallaby snaring was being carried out in the

TABLE 7. An analysis of the stomach contents of 30 Devils collected at Icena in July, 1964.

Materials found in stomachs	Instances of occurrences
Unidentified flesh	6
Wallaby (probably *W. rufogrisea*) gut	1
Devil (*S. harrisi*) fur	2
Wallaby (*W. rufogrisea*) fur	9
Brush Possum (*T. vulpecula*) fur	1
Unidentified fur	10
Wool	3
Unidentified feathers	1
Crushed bone	1
Vegetable matter (grass, bark)	7
Gravel	1
Excess water-like fluid	1

vicinity by a professional snarer and the Devils were apparently feeding on snared animals. It is usual for a number of Devils to feed on one carcase and in many instances a whole Wallaby, which may weigh up to 40 lbs., would be eaten over night. This performance might be repeated several times in every mile of the snare line. The only evidence of the catch would be a sprung snare, trampled vegetation and perhaps and odd Wallaby tooth and a little fur.

Most of the unidentifiable fur (see table 7) was probably that of *W. rufogrisea.*

The occurrence of wool in 3 stomachs was considered normal. Sheep graze throughout the area and as some deaths are inevitable from various causes it is natural that some wool would be ingested in the course of Devils scavenging on sheep carcases.

Most of the vegetable matter and gravel was probably taken while the animals were in the traps. In their endeavours to escape Devils will chew at anything within reach, and, as a result, their teeth and mouths were often found to be heavily soiled with dirt and litter.

The occurrence of Devil fur in two instances is further evidence of their cannibalistic habits. In January 1966, I was given a live half grown Devil which had just been trapped near Kelso at the mouth of the Tamar River. At the time of release the foot by which it had been caught appeared to be undamaged. When I inspected the animal several hours later three toes and half the manus were missing from the trapped foot. Upon later examination of the stomach contents the missing members were found in an undigested state, apparently having been chewed off and swallowed by the Devil in an attempt to relieve the pain. The stomach contents of this animal also included remains of marine crabs and fish scales.

Guiler (1960; 1964) lists many additional food items including snakes, all of which are venomous species in Tasmania. B. C. Mollison (pers. comm.) also records reptiles as food items of Devils but it is not known whether they are taken alive or scavenged after having died from other causes.

Mollison (1961) records mortality from poisoned baits of a bran-pollard mix.

(vii) General Comments

Many of the older Devils were heavily scarred about the head, apparently as a result of fighting. In some instances deep wounds were suppurating freely. Lesions on the nose and lips were common and in extreme cases caused distortion of features.

Most of the Devils collected were found to have been previously snared by the neck in Wallaby snares. Snares are made of several strands of fine pliable wire rolled together and are normally set along a fence on well worn Wallaby runs. In the Icena area these runs are very numerous and along most fence lines in bush country they may be as frequent as 5 or 6 in every 100 yards.

Devils follow these runs regularly and though they repeatedly become snared they soon chew through the wire strands of the lead, thus escaping with the tight fitting wire loop still fastened round the neck. The professional snarer operating in the area informed me that he had seen Devils carrying as many as three snares.

Though some are able to remove the snare later, others do not or cannot, with the result that it aggravates the skin and in extreme cases causes a deep suppurating wound round the neck. Several Devils were found in this condition and others carried snares which had caused injuries of a lesser degree. Most Devils possessed neck wounds or lesions in evidence that they had at some time been snared.

No signs of sickness or disease were evident.

Ectoparasites were collected from a range of Devils and have been deposited in the National Insect Collection, Canberra. Determinations, available at the time of writing, from this series and other samples collected by B. C. Mollison and T. O. Wolf are listed in table 8.

TABLE 8. Ectoparasites collected from Devils.

ACARINA

Ticks (detemined by Dr. F. H. S. Roberts)

Ixodes tasmani. Hilltop, (♀) 24.II.1961 ; Maydena, (♀♀) 11.V.1961, 2.II.1962; Rocherlea, (♀♀ & larvae) 11.II.1962; Florentine Valley, (♀♀) 22-29.VII.1964.

I. fecialis. Maydena, (♀♀) 2.II.1962 ; Icena, (♀♀) 22-29.VII.1964.

INSECTA

Fleas (determined by Dr. G. M. Dunnet)

Uropsylla tasmanicus. Icena, 22-29.VII.1964.

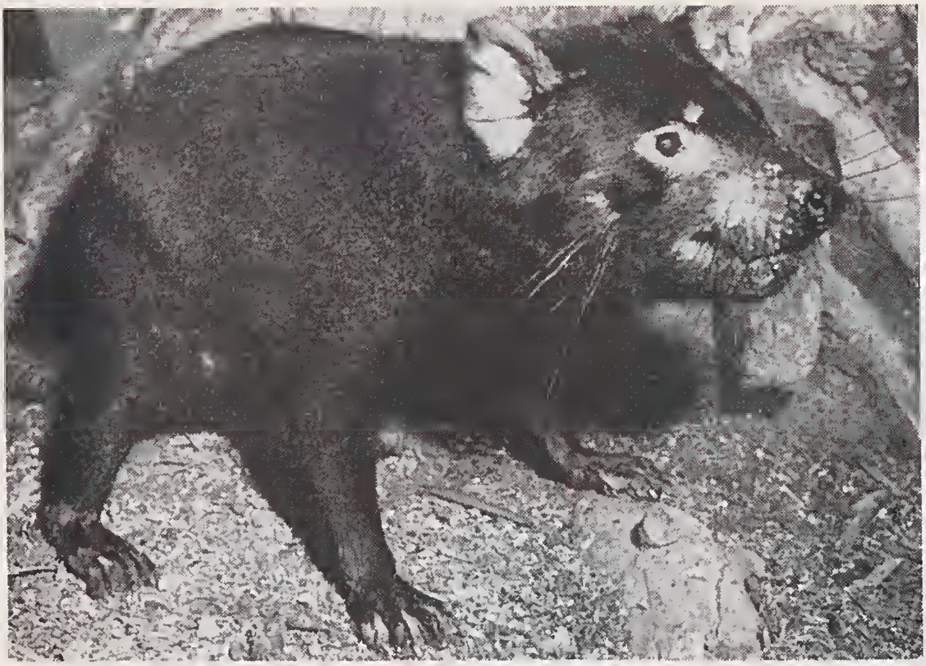

Plate 1. A male Tasmanian Devil. (Photo by courtesy of Mr. Lionel Jensen).

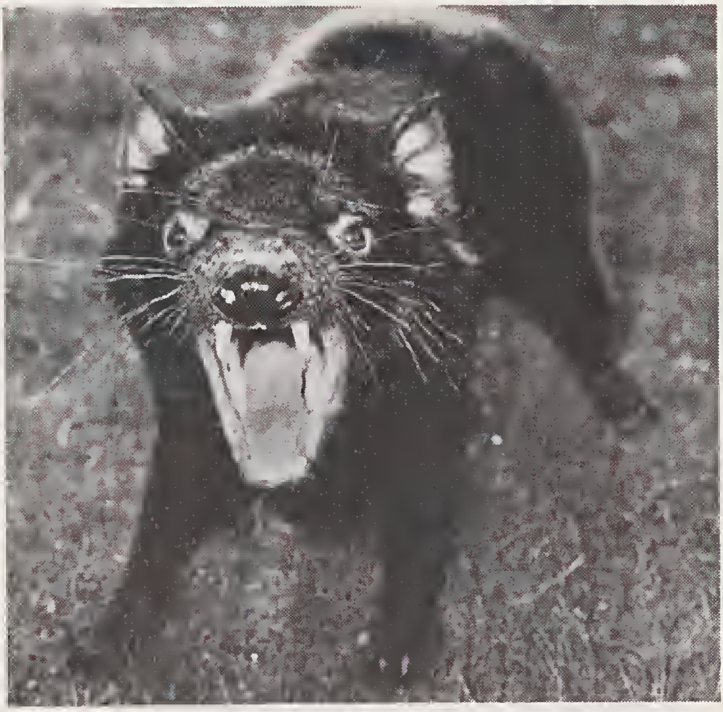

Plate 2. A male Tasmanian Devil in a defensive threat posture.
(Photo by courtesy of Mr. Lionel Jensen).

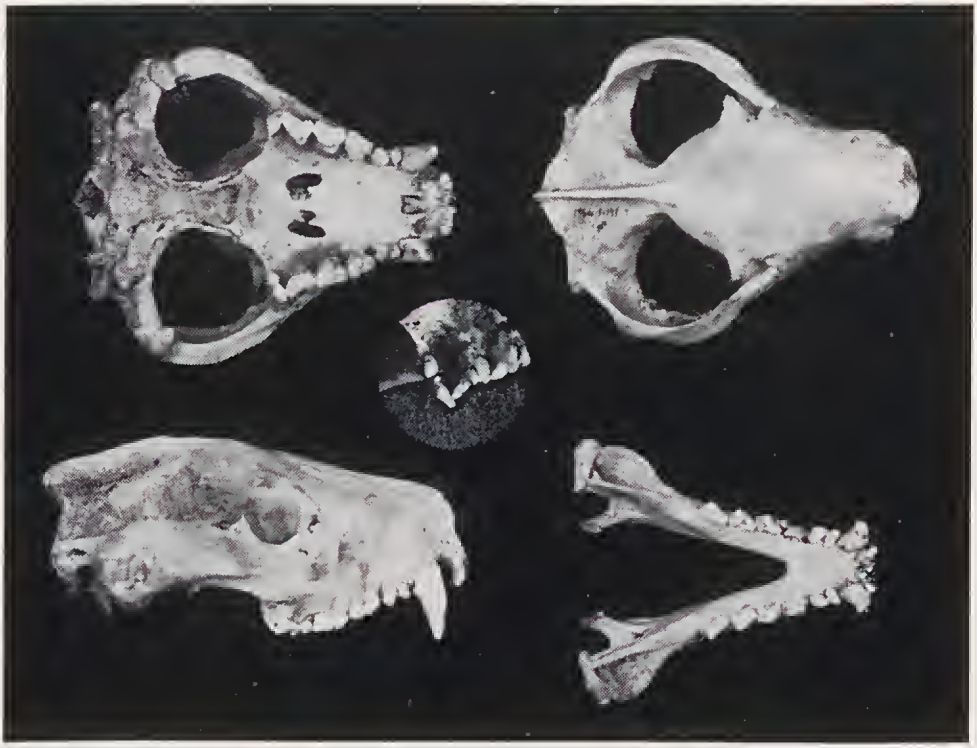

Plate 3. Skull and mandible of *S. harrisi* (Reg. No. 1964:1:191). The abnormal tooth is shown inset.

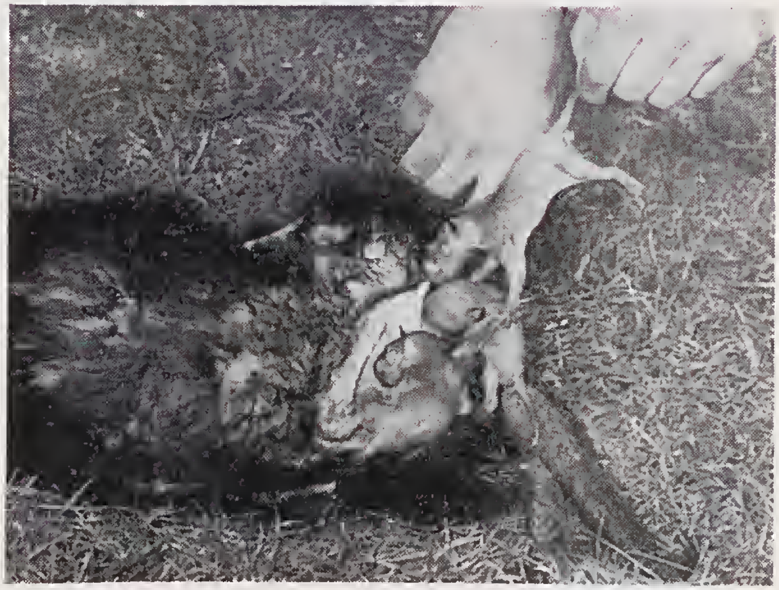

Plate 4. Tasmanian Devil (Reg. No. 1964:1:151) with three young partly removed from the pouch.

Plate 5. The carcase of a freshly killed Devil showing heavy fat deposits.

Plate 6. A male Quoll.

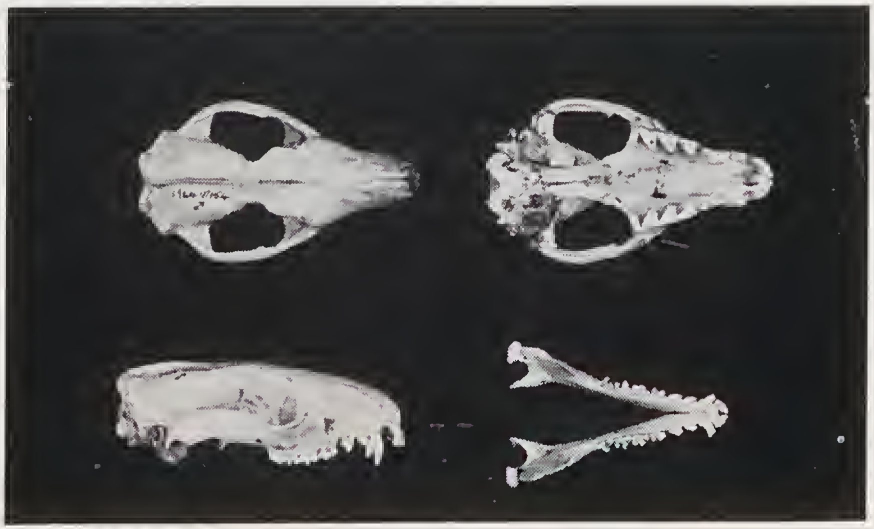

Plate 7. Skull and mandible of *D. viverrinus* (Reg. No. 1964:1:154).

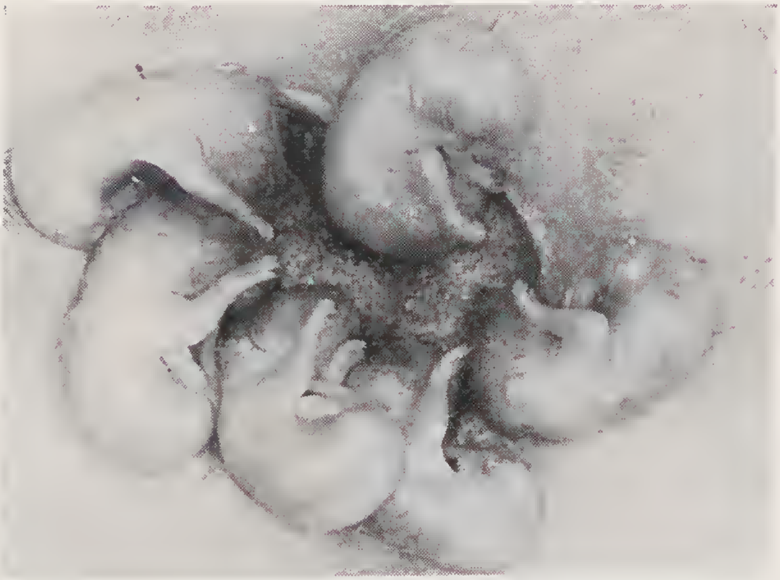

Plate 8. The pouch of a Quoll opened to expose the six pouched young.

The general condition of the animals was very good and most carried heavy fat deposits. This was more pronounced in the older animals and it was usual for them to have a subcutaneous fat layer up to half an inch in thickness and visceral deposits which completely covered the intestines and kidneys (see plate 5).

It appears probable that the high Devil population encountered at the present time is being supported by a readily available food supply far in excess of pre-settlement days. Wallabies and Possums are very numerous in the area and the commercial snaring of these animals provide an easy catch for the nocturnal Devil. The expansion of the grazing industry is also providing an additional and increasing food source in the form of natural stock deaths. Though this development is removing forever some of the habitat essential for the survival of the species, there is much which appears too rough for improvement and will probably remain in its present state for many years.

Devils will hide by day in any available cover such as Wombat holes, hollow logs, beneath buildings or in dense bush, and the undeveloped bushland provides the best areas for such diurnal retreats. At dusk they venture out on their nocturnal prowl and are capable of travelling several miles from their lairs in search of food.

It is doubtful if they will kill grown sheep in a normal healthy condition but they quickly recognize the sick or dying animal as an easy kill; consequently weak or motherless lambs provide an easy prey. Tethered or closely penned sheep are always liable to nocturnal attack and a sheep dog pup belonging to an employee of Icena estate was killed and completely eaten while on its chain.

Such instances of predation on domestic stock naturally incite the primary producer to exercise some measure of control. As a result, no doubt, some Devils are killed illegally but a number of permits have been issued in recent years for their destruction in limited areas when the circumstances demanded.

It is difficult to assess whether land clearing and development will eventually have an adverse affect on the well-being of the Devil but it is today probably more numerous in some districts than ever before. Provided it remains free from epidemic diseases or other limiting factors acting at a critical level, I see no reason why it should not continue to flourish indefinitely in many parts of the State.

V. DASYURUS VIVERRINUS

(i) General Description

The Quoll (see plate 6) is a sleek, short legged and active animal. Full grown individuals rarely stand above 6 inches at the shoulders though they may attain a head and body length of up to 18 inches and a tail to 11 inches. Mature males may weigh up to 1400 gm.

The head and neck are stout and the jaws are comparatively large and powerful. The canine teeth are long and slender, the muzzle elongated and pointed. When at large it is always alert ; its movements are stealthy and when the need demands it can move with great swiftness. In the wild state it has an inquisitive nature and will enter huts and bushmen's camps in search of food. It is easily approached with the use of a spot light and Weindorfer and Francis (1920) found it apparently oblivious of danger from dogs when its attention was held by the beam of a lamp.

In captivity it is shy and nervous but inoffensive unless provoked. Its bite is capable of inflicting a severe wound but with care wild caught animals can be tamed and handled. When agitated or frightened it will sometimes utter gutteral sounds described by Weindorfer and Francis (1920) as "not unlike those produced by the cracking of nuts in quick succession".

(ii) Body Weight and Size

In average weight and size males exceeded females by a significant margin (see table 9). The tail, ear and pes, expressed as a percentage of the total length (see table 10), gives some idea of the body proportions of both sex groups but shows very little sexual dimorphism.

TABLE 9. Comparative body measurements of males and females of the Quolls, showing the range with mean in brackets. Weight in grams length in millimetres.

	Males (36)	Females (13)
Weight	850 - 1550 (1131.6)	600 - 1030 (818.4)
Total length	525 - 655 (568.8)	475 - 580 (535.2)
Tail length	200 - 280 (240.9)	173 - 240 (220.8)
Ear length	49 - 57 (52.0)	46 - 51 (49.5)
Pes length	61 - 75 (69.4)	60 - 68 (64.1)

TABLE 10. Showing length of tail, ear and pes expressed as a percentage of the total length of males and females of the Quolls.

	Males	Females
Tail length	42.35	41.25
Ear length	9.1	9.3
Pes length	12.2	11.9

TABLE 11. Comparative skull measurements of males and females of the Quolls. The mean is shown in brackets.

	Males		Females	
Condylo-basal length	73.0 - 90.0	(81.9)	69.6 - 78.5	(74.1)
Zygomatic width	42.7 - 52.8	(47.1)	39.4 - 46.0	(42.0)
Post orbital constriction	11.0 - 13.2	(12.2)	11.8 - 13.5	(12.5)
Cranium width	26.5 - 33.3	(30.7)	26.6 - 29.5	(28.0)
Pre optical width	24.0 - 29.0	(26.3)	23.0 - 25.0	(24.0)
Snout width	15.4 - 18.6	(16.9)	14.3 - 15.8	(15.1)
Palatal length	41.2 - 50.0	(46.2)	41.0 - 44.1	(42.1)
Mastoidal width	27.4 - 35.0	(31.1)	27.6 - 30.2	(28.7)
Alveola length	15.5 - 17.0	(16.3)	15.0 - 16.3	(15.6)
Width at M^3	25.5 - 29.6	(27.5)	24.3 - 27.3	(25.6)

TABLE 12. Showing the Quoll skull measurements expressed as a percentage of the condylo-basal length.

	Males	Females
Zygomatic width	57.5	56.5
Post orbital constriction	14.9	16.9
Cranium width	37.5	37.8
Pre optical width	32.1	32.4
Snout width	20.6	20.4
Palatal length	56.4	56.8
Mastoidal width	40.0	38.7
Alveola length	19.9	21.0
Width at M^3	33.6	34.5

(iii) Skull

The measurements tabulated in table 11 show the skulls of males (see plate 7) are on the average significantly larger than those of females and are narrower in the post-orbital region, as is also the case with the Devil.

The mean skull dimensions are expressed as a percentage of the condylo-basal length (see table 12) to give an indication of proportions. Only very slight sexual dimorphism is indicated.

The sagital crest was slightly higher in the larger and apparently older animals.

Tooth wear was noticable to varying extents but in no instance was it found to be severe. Tooth fracturing was found to occur in many instances and any tooth may be affected.

The normal dental formula of I.4/3; C.1/1;P.M.2/2; M.4/4; was found in every animal save Reg. No. 1964:1:210♂ in which a malformation of the molars occurred. The right M^3 lacked the inside cusp, though this may have been due to fracturing at some time, and the right M^4 was rudimentary and similar in size to an incisor.

No evidence of decay in the teeth was found in any member of the Icena series.

(iv) Pelage

The Quoll is dimorphic in pelage colour and the differing phases are commonly referred to as "blacks" and "greys". Both are marked with 60 to 80 white spots of from 5 mm. to 20 mm. in diameter which are haphazardly distributed over most of the body. Twelve (24%) of the Icena series were of the black phase and 37 (76%) were of the grey phase. Gould (1863) found a predominance of the grey phase animals and Batey (1907) found a predominance of greys over blacks in the Sunbury district of Victoria.

The main pile of the body fur reaches a length of 20 mm., is dense and of a soft texture. The two colour phases differ only by virtue of the colour of the subterminal zone of the body fur. In both, the basal 75% is a dark slaty grey slightly paler on the ventral surface. In the "blacks" the whole of the terminal 25% is black except on the ventral surface where it has a brownish tinge. In the "greys" the greater part of the terminal 25% is sandy yellow with only the extreme tips black. On the ventral surface the terminal 25% is pure white. The guard hairs reach a length of 35 mm. and in both phases the dorsals are a uniform black throughout their whole length. The ventral guard hairs of the "blacks" are a reddish-brown while those of the "greys" are entirely white. In both forms the body fur and guard hairs in the spotted areas are pure white for their whole length.

The hair on the feet rarely exceeds 5 mm., is a reddish-brown in the "blacks" and white in the "greys".

The ears are naked internally, except near the tip Externally, sparse hairs reach to 2 mm. They are black in the "blacks" and white in the "greys".

The hair on the tail is harsh in texture and is longest on the terminal half where it usually exceeds 40 mm. and occasionally reaches to 80 mm. In the black phase it is a uniform colour except for a tendency to brownish on the distal under side. In the grey phase the tail has a fox-like appearance with the hairs on the dorsal surface being sandy yellow with a slight black tip and those on the ventral surface being pure white. In both phases the basally grey body fur is present on the proximal portion of the tail but lessens posteriorly and is absent on the distal portion.

The vibrissae of the black phase are all black whereas those of the grey phase may be black, brown or white. The mystacial reach to 60 mm. with up to 25 in each set, the genal to 60 mm. with up to 8 in each set, interramal to 30 mm. with up to 4 per set, and supraorbital to 45 mm. with up to 4 per set.

(v) Breeding

Of the 13 females collected, only one was found with an unoccupied pouch and she showed no signs of breeding. She appeared to be a mature animal and the body weight of 740 gm. was considerably greater than the lightest breeding female. The pouch opening of 35 mm. was in common with the lactating females but the pouch depth of 5 mm., forward of the anterior edge of the pouch, was considerably less than most. Nipples reached to 1 mm. An examination of the reproductory organs revealed no obvious signs of pregnancy.

Of the 12 lactating females, 10 carried the full complement of 6 young (see plate 8). The remaining two carried 5 young each, the unoccupied nipples being the posterior and anterior right respectively.

Four sets which came to hand from the Icena area just prior to the collection of the series under discussion have been included in table 13.

The pouch opening, measured in its normal relaxed position on dead animals, ranged between 30 mm. and 40 mm. in width. Pouch depth ranged from nil in the case of Reg. No. 1964:1:155 with the nearly new-born young, to 25 mm. in the case of 1964:1:205 with six young of a crown-rump length of 22 mm.

The interior of the pouch appeared clean with hair growing from the whole area. That originating in the vicinity of the nipples ranged to 15 mm. in length and that nearer to the pouch opening to 30 mm. In the "blacks" it was pale brown with a pinkish stain. In the "greys" it was originally white but had now become stained to a pale pinkish brown. It was sufficiently dense and tangled to give support to the new-born young and its presence may also assist in maintaining a suitable pouch environment in the early period of the growth of the young.

Nipple complement was invariably 6. In Reg. No. 1964:1:155 with a crown-rump of 6 mm., they reached 2 mm. in length and the tip, within the mouth of the young, was slightly swollen to 0.5 mm. Nipples lengthen with the growth of the young and in Reg. No. 1964:1:165, with a crown rump of 18 mm. they reached to 8 mm., the tip within the mouth of the young being enlarged and laterally compressed to 2 mm. The new-born young were relatively undeveloped except for the front feet in which the toes were prominent. The hind legs were mere buds and there was no obvious development of the ears, eyes or nose.

The colour phase which the young eventually assume is determinable from the time they attain a crown rump length of 10 mm. At this stage a grey pigmentation has developed in the nose of the "blacks", while in the rest it remains white. This feature becomes more noticeable as the young develop further.

The sex of the young is easily determinable after they have attained a crown rump length of about 18 mm.

Vibrissae and hair begin to erupt in the facial regions at a crown rump length of 25 mm.

TABLE 13. An analysis of 16 sets of pouched young of the Quolls collected at Icena, Gladstone. Reg. Nos. 1964:1:107 to 112 were collected prior to the main series. 1964:1:107 was captured with six young but lost one in transit. * indicates "black" ♀ parent.

Reg. No.	Black			Grey			Total	Av. crown-rump length in mm.	Date collected
	♂	?	♀	♂	?	♀			
1964 : 1 : 107		1			4		5 (+1)	15	5.VII.1964
1964 : 1 : 108		3			3		6	17	5.VII.1964
1964 : 1 : 111		2			3		5	11	26.VI.1964
1964 : 1 : 112		1			5		6	15	26.VI.1964
1964 : 1 : 129				2		4	6	22	21.VII.1964
1964 : 1 : 149				5		1	6	23	23.VII.1964
1964 : 1 : 155							6	6	27.VII.1964
1964 : 1 : 164				1		5	6	22	25.VII.1964
1964 : 1 : 165			1			5	6	18	25.VII.1964
1964 : 1 : 169	2		1	1		1	5	30	25.VII.1964
1964 : 1 : 173*		1			4		5	17	25.VII.1964
1964 : 1 : 183*		2			4		6	15	26.VII.1964
1964 : 1 : 190			2	2		2	6	25	27.VI.1964
1964 : 1 : 193	2		1			3	6	23	28.VII.1964
1964 : 1 : 195			1	3		2	6	26	28.VII.1964
1964 : 1 : 205				1		5	6	22	29.VII.1964
Totals	4	10	6	15	23	28	92		
	20 Blacks			66 Greys			6 Indeterminable		

TABLE 14. An analysis of the stomach contents of 31 Quolls collected at Icena in July, 1964.

Materials found in stomachs	Instances of occurrences
Unidentified flesh	4
Unidentified fur	4
Wool	1
Unidentified feathers	1
Green vegetable matter	4
Dead grass	10
Corbie grubs to 30 mm.	5
Earth worms	2
Nematodes to 40 mm.	1
Excess water-like fluid	5
Empty	5

An analysis of 16 sets of pouched young from Icena (see table 13), based on the above criterions, revealed that of the 92 pouched young therein contained, 86 were determinable for colour phase. Of these 20 or 23.3% were "blacks" and 66 or 76.7% were "greys". This proportion is nearly similar to that of the adult sample. The sex of 53 young was determinable, 19 (36%) being males and 34 (64%) females. This sex ratio is in reverse to that found in the sample of adults under discussion. Testes of males ranged from 14 x 11 mm. to 17 x 13 mm.

(vi) Stomach Contents

Thirty-one of the stomachs were examined immediately after skinning and the contents found to be poorly masticated. Both animal and vegetable matter were represented (see table 14). Most of the Quolls collected from the areas of agricultural land were found to contain Corbie grubs (*Oncopera* sp.) which is a common pasture pest in the areas of agricultural development (Evans 1943).

In the larval stage *Oncopera* lives in a subterranean burrow by day and emerges at night to feed on surface vegetation. In most instances where larvae had been ingested, other food items were also present, but one stomach was found to be filled with larval skins only.

Many stomachs contained small amounts of dry grass, which appeared to have been taken in the course of feeding on Corbies. Two Quolls collected from a wet turnip paddock were found to have been feeding on earth worms.

Green vegetable matter was present in odd stomachs. In some instances this appeared as if it may have been taken fresh but in most it appeared similar to the stomach contents of Wallabies and could have been scavenged from the site where Devils had eaten a Wallaby. One stomach contained a quantity of nematodes of about 40 mm. in length and similar to a parasite commonly occurring in the stomachs of Wallabies. These may also have been ingested while scavenging.

The occurrence of the invertebrate food items in these stomach samples suggests that the Quoll probably takes other pasture pests and the adults of *Oncopera* sp. during the summer months. Sharland (1962) lists frogs and lizards as part of their diet. Mollison (1961) records mortalities on poisoned baits of apples, carrots and a bran-pollard mix. Their highly developed carnivorous dentition suggests a diet of small mammals and birds and their powerful sharp claws equip them for arboreal activities. No doubt they prey to some extent on roosting birds ; but the mixed nature of the food items indicates that they are unselective opportunist feeders.

(vii) General Comments

All the Quolls collected were free from wounds or lesions of any kind and they exhibited no visible marks from fighting. Though they probably run the Wallaby pads they do not fall victim to snares as do the Devils, their smaller size and stealthy movement enabling them to avoid the noose.

Ectoparasites were collected from a range of Quolls and have been deposited in the National Insect Collection, Canberra. Determinations available at the time of writing, from this series and other samples collected by the author, B. C. Mollison and T. Andersen, are listed in table 15.

TABLE 15. Ectoparasites collected from Quolls.

ACARINA

Ticks (determined by Dr. F. H. S. Roberts).

Ixodes tasmani. Sandford, (nymphs) 8.V.1961; Icena, (nymphs) 13.V.1961; Mt. Wellington, (nymphs & larvae) 12.XI.1961.

I. antechini. Maydena, (nymphs) 9.II.1961 ; Icena, (nymphs) 13.V.1961.

I. fecialis. George Town, (nymphs) 12.III.1962; Icena, (♀♀ & nymphs) 21-30.VII.1964.

Mites (determined by Mr. R. Domrow)

Andreacarus radfordi. Icena, 13.V.1961.

Laelaptidae sp. George Town, 12.III.1962.

INSECTA

Fleas (determined by Dr. G. M. Dunnet)

Pygiopsylla hoplia. Maydena, 9.II.1961 ; Kingston, 16.III.1961; Sandford, 8.V.1962 ; Lesley Vale, (♂♂ &♀♀) 26.VII.1962; Icena, 21 - 30.VII.1964.

P. zethi. Kingston, 16.III.1961; Sandford, 8.V.1962.

Acanthopsylla rothschildi nercis. Maydena, 9.II.1961.

A. sp. Icena, 21-30.VII.1964.

Stephanocircus dasyuri. Kingston, 16.III.1961 ; Mt. Barrow, 19.V.1961; Mt. Wellington, 12.XI.1961; Sandford, 8.V.1962; Lesley Vale, (♂ & ♀♀) 26.VII.1962.

S. simsoni. Maydena, 9.II.1961.

Uropsylla tasmanicus. Icena, (♂ & ♀♀) 13.V.1961 ; Sandford, 8.V.1962; Lesley Vale, 26.III.1962.

Small parasitic maggot-like larvae were found imbedded in the skin of the ears and scrotum of many animals. These have recently been identified as the larva of the flea *Uropsylla tasmanicus* by R. M. Warneke, Fisheries and Wildlife Department, Victoria. (pers. comm.)

The inclusion of mites in a sample of parasites collected from Quolls at Icena on 13:V:1961 resulted in the description of a new genus and species *Andreacarus radfordi* Domrow (1963). This mite was also recorded from the endemic Tasmanian Pigmy Possom *Eudromicia lepida* at Greens Beach on 13:VIII:1961 (J. H. Calaby, pers. comm.).

Many Quolls had large cyst-like lumps in the wall of the small intestines and these were found to contain filariids (Munday 1966).

The general condition of the animals was very good. Most carried heavy subcutaneous and visceral fat deposits though in no instance was this as extreme as in the Devils. This parallels the observations of Weindorfer and Francis (1920) who found that its condition is invariably poor in summer but fat in winter.

In north-eastern Tasmania the Quoll was found to co-exist with the Devil and although its diet differs somewhat from that of the Devil it also appears to benefit from the initial effects of settlement and land utilisation. With pasture establishment comes an increase in the supply of invertebrate food items such as worms and pasture pests and it is apparently an effective predator on these as well as small vertebrate animals. Though normally a ground dweller it is also a good climber and often uses this facility in its search for food.

It does not appear as gregarious in its feeding habits as the Devil but initial collecting indicates that a pair often hunt and feed together.

It normally hides by day in a nest formed with any available material and secluded in dense undergrowth, hollow logs, beneath buildings, holes in the ground or any such retreats.

In north-eastern Tasmania it is possibly more numerous than ever before and like the Devil it appears to be spreading, though perhaps not as spectacularly. Its feeding habits render it a lesser pest to the primary producer than the Devil and it is not likely that direct control measures will have to be taken against its numbers. As previously mentioned, it is subject to some mortality where Devil control is necessary and no doubt would likewise suffer if rabbit trapping or poisoning were undertaken on a large scale within the areas of its population. However, while it remains free from epidemic diseases that have in the past decimated whole populations in Tasmania and south-eastern Australia, (Wood Jones 1923), I see no reason why it should not continue to thrive for many years.

⁂

ACKNOWLEDGEMENTS

The author wishes to record his appreciation of the assistance given by Mr. R. M. Warneke, Fisheries and Wildlife Department, Melbourne for his encouragement, help and criticism of the manuscript, Mr. J. G. Simmons, Launceston, for providing the botanical determinations and Dr. J. Nelson, Monash University and Mr. B. Munday, Department of Agriculture, Launceston for advice and assistance.

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